

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
27 December 2001 (27.12.2001)

PCT

(10) International Publication Number
WO 01/98604 A1

(51) International Patent Classification⁷: **E04F 15/04**

(21) International Application Number: PCT/SE01/01343

(22) International Filing Date: 14 June 2001 (14.06.2001)

(25) Filing Language: Swedish

(26) Publication Language: English

(30) Priority Data:
0002342-4 22 June 2000 (22.06.2000) SE

(71) Applicant (for all designated States except US): **TAR-KETT SOMMER AB** [SE/SE]; Box 16, S-289 89 Hanaskog (SE).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EC, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **STRIDSMAN, Per-Eric** [SE/SE]; Fridhäll, S-289 50 Hanaskog (SE).

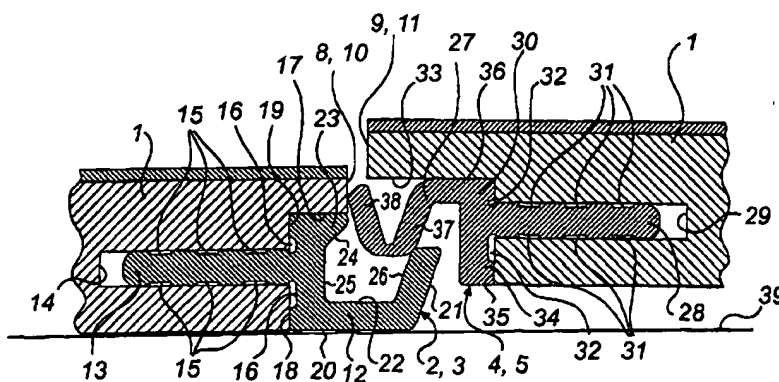
Published:

— with international search report

(74) Agent: **AWAPATENT AB**; Box 5117, S-200 71 Malmö (SE).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FLOOR BOARD WITH COUPLING MEANS



WO 01/98604 A1

(57) Abstract: A floor board, which comprises coupling means (2-5) at its side edges (8-11), is arranged to be connected to other similar floor boards to form a floor. The floor board (1) has at least one pair of coupling means consisting of a female coupling means (2, 3) and a male coupling means (4, 5), which extend along two opposite side edges (8, 9; 10, 11). The female coupling means (2, 3) comprises a first coupling element (12), which projects laterally and which has an upwardly open groove (22). The male coupling means (4, 5) comprises a second coupling element (27), which has the shape of an upwardly open V, the outer V-leg (38) of which is springingly foldable in the direction of the inner V-leg (37). The two coupling elements (12, 27) are located in such manner that, when interconnecting two similar floor boards, the groove (22) in the first coupling element (12) of one of the floor boards is situated directly under the V-shaped second coupling element (27) of the other floor board when the floor boards are in such a position relative to each other that their side edges (8, 9; 10, 11) facing each other are vertically aligned. The two floor boards are interconnectible by pressing, from said relative position, said other floor board downwards, whereby the outer V-leg (38) of the second coupling element (27) is springingly folded, said V-leg springing back to its initial position and snapping in under a stop once the second coupling element (27) has been inserted into the first coupling element (12).

FLOOR BOARD WITH COUPLING MEANSField of the Invention

The present invention relates to a floor board of elongated rectangular shape, which comprises coupling means at its lateral edges and which is arranged to be connected to other similar floor boards to form a floor, which is made up of a plurality of adjacent, parallel rows of juxtaposed floor boards and in which the floor boards of one and the same row are interconnected short side to short side and the floor boards of adjacent rows are interconnected long side to long side, the coupling means being composed of a first pair of coupling means consisting of a female coupling means and a male coupling means, which extend along the one and the other long side edges of the floor board, respectively, and a second pair of coupling means consisting of a female coupling means and a male coupling means, which extend along the one and the other short sides of the floor board, respectively.

Background Art

In common, prior-art floor boards of this type, the female coupling means consist of grooves and the male coupling means of tongues (or feathers). A laterally open groove is formed in one of the long side faces of the floor board, and a laterally open groove is formed in one of its short side faces, the two grooves extending along the board's entire length and width, respectively. A laterally projecting tongue is formed on the other long side face of the floor board, and a laterally projecting tongue is formed on its other short side face, the two tongues extending substantially along the board's entire length and width, respectively. These floor boards are intended to be interconnected so as to form a floor. For this purpose, the tongues of a floor board are inserted horizontally into a long side groove of another floor

board and into a short side groove of yet another floor board. The dimensions of the grooves and tongues are chosen so that the tongues are insertable into the grooves with a very tight fit. Before the tongues are
5 inserted into the grooves, glue is applied in the grooves. The grooves and tongues provide a relative locking of the interconnected floor boards perpendicularly to the floor level, and the glue causes a relative locking parallel to the floor level.

10 The floor boards described above have several disadvantages. An important disadvantage is that once the floor has been installed it cannot be taken up without the floor boards being damaged. Thus, the floor boards cannot be reused once they have been taken up. Another
15 disadvantage, caused by the tight fit between groove and tongue, is that it might be difficult to insert the tongues into the corresponding grooves, and that it may therefore be necessary to use tools to knock the floor boards into an interconnected position without any gap
20 between the boards. This entails a considerable risk of the floor boards being damaged. A further disadvantage is that glue has to be used in the installation of the floor, which is not only difficult but also time-consuming.

25 In other prior-art floor boards, some of these disadvantages have been eliminated by dimensioning the grooves and tongues so that it is relatively easy to insert the tongues into the grooves. To interconnect these floor boards different kinds of clips are used,
30 said clips being placed under two juxtaposed floor boards in such manner that they engage in grooves on the underside of the floor boards by means of upwardly projecting protrusions. This solution allows an installed floor to be taken up in such manner that the floor boards may be
35 reused. A disadvantage of the solution is, however, that loose parts in the form of clips need to be assembled during installation of the floor and that it implies a

relatively difficult adjustment of the floor boards with regard to groove-tongue and clips-clip grooves.

Summary of the Invention

5 The object of the present invention is to provide a floor board which is designed so as to allow a floor to be installed in an extremely simple manner and without using loose parts or glue by means of a plurality of such similar floor boards and to make it possible to take up the floor boards and reuse them.

10 According to the invention, this object is achieved with a floor board of the type described by way of introduction, which is characterised in that the female coupling means in at least one of said two pairs of coupling means comprises a first coupling element, which projects
15 laterally from said one long side edge/short side edge and extends along this edge at a level below the upper surface of the floor board and which has an upwardly open groove extending along the first coupling element and an upper portion with a lower surface, which extends ob-
20 liquely upwards and over the groove a short distance from the inner limiting wall thereof so as to form a stop, that the male coupling means in said one pair of coupling means comprises a second coupling element, which has substantially the shape of an upwardly open V and which
25 extends along said other long side edge/short side edge in a longitudinal recess formed in the lower portion thereof, the outer V-leg of the second coupling element being springingly foldable in the direction of the inner V-leg of the second coupling element, and that the ex-
30 ternal V-shape of the second coupling element in its nondeformed state is substantially complementary to the shape of the groove of the first coupling element, the two coupling elements being located in such manner that, when interconnecting two similar floor boards, the groove
35 in the first coupling element of one of the floor boards is situated directly under the substantially V-shaped second coupling element of the other floor board when the

floor boards are in such a position relative to each other that their side edges facing each other are vertically aligned, and the two floor boards being interconnectible by pressing the second coupling element of said other floor board down into the first coupling element of said one floor board, whereby the outer V-leg of the second coupling element is springingly folded, said V-leg springing back to its initial position and snapping in under said stop once the second coupling element has been inserted into the first coupling element.

The upper portion of the outer V-leg of the second coupling element projects laterally from said other long side edge/short side edge.

The female coupling means and the male coupling means preferably comprise a first and a second plastic section, respectively, having a flange which projects laterally from the first and the second coupling element, respectively, and which is mounted in a first and a second notch, respectively, formed at said one and said other long side edge/short side edge, respectively.

The flanges may be mounted in the respective notches by means of glue. The flange of both the first and the second plastic section is suitably provided with longitudinal, glue-receiving ducts that are substantially rectangular in cross section.

Brief Description of the Drawings

The invention will now be described in more detail with reference to the accompanying drawings, in which

Fig. 1 illustrates a floor board according to the invention as seen from above;

Fig. 2 is a plan view of a floor which is made up of a plurality of juxtaposed floor boards according to Fig. 1;

Figs 3-5 illustrate the interconnection of two floor boards according to Fig. 1; and

Fig. 6 illustrates how two floor boards that have been interconnected can be separated.

Description of a Preferred Embodiment

The floor board shown in Fig. 1 has a conventional, elongated rectangular shape. Floor boards of this type usually have a length of about 1200 mm and a width of about 190 mm. The floor board 1 has at its four side edges coupling means 2, 3, 4, 5 which are arranged to interact with the corresponding coupling means on other similar floor boards 1 during installation of a floor 6 (Fig. 2), so as to interconnect the floor boards. As shown in Fig. 2, the floor is made up of a plurality of adjacent, parallel rows 7a, 7b, 7c of juxtaposed floor boards 1, the floor boards 1 of one and the same row 7a, 7b, 7c being interconnected short side to short side and the floor boards 1 of adjacent rows 7a, 7b, 7c being interconnected long side to long side.

The coupling means 2-5 are composed of a first pair of coupling means 2, 4 consisting of a female coupling means 2, which extends along one long side edge 8 of the floor board 1, and a male coupling means 4, which extends along the other long side edge 9 of the floor board 1, and of a second pair of coupling means 3, 5 consisting of a female coupling means 3, which extends along one short side edge 10 of the floor board 1, and a male coupling means 5, which extends along the other short side edge 11 of the floor board 1.

The female coupling means 2, 3 in each pair of coupling means 2, 4 and 3, 5 consists of a section made of a plastic material. This plastic section has a first coupling element 12 and a flange 13, which projects laterally from said element and which is mounted by means of glue in a horizontal notch 14 formed at the side edge 8, 10. In its upper side and underside, the flange 13 is provided with longitudinal ducts 15 that are substantially rectangular in cross-section.

When attaching the female coupling means 2, 3 to the floor board 1, which is done in the factory during manufacture of the floor board, glue is applied to the flange 13, which is then inserted into the notch 14. When
5 the glue has set, it adheres well to the upper and lower limiting walls of the notch 14 since the core of the floor board 1 in which the notch 14 has been formed, in the embodiment shown and as is usually the case, is made of a fibreboard or the like. The glue does not adhere as
10 well to the plastic material of the flange 13, however, but this is compensated for by the fact that the glue, once set, fills the ducts 15 in the flange and thereby prevents the female coupling means 2, 3 from being extracted.

15 The notch 14 has a widened portion 17 at its mouth, said portion receiving part of the first coupling element 12. The widened portion 17 extends downwards to the underside of the floor board 1, but is terminated a short distance from its upper side.

20 The first coupling means 12 is located below the upper side of the floor board 1 and comprises a vertical, inwardly facing side 18, which abuts against the shoulder 19 formed by the transition between the main part of the notch 14 and its widened portion 17. Recesses 16 for collecting any excess glue during insertion of the flange 13
25 of the female coupling means 2, 3 into the notch 14 are formed at the side 18. The first coupling means 12 further comprises a horizontal underside 20, which is located on a level with the underside of the floor board 1, and an outwardly facing side 21, which extends steeply
30 (about 80 degrees) obliquely upwards-outwards. An upwardly open groove 22 is formed in the first coupling element 12. The first coupling element 12 also has an upper portion 23 with a lower surface 24, which extends
35 about 45 degrees obliquely upwards a short distance over the groove 22 from the inner limiting wall 25 thereof to form a stop. The outer edge of the upper portion 23 is

located in line with the edge 8, 10 of the floor board 1. The outer limiting wall 26 of the groove 22 is substantially parallel to the outwardly facing side 21 of the first coupling element 12.

5 The male coupling means 4, 5 in each pair of coupling means 2, 4 and 3, 5 comprises a section made of a plastic material. The plastic section has a second coupling element 27, a laterally projecting flange 28, which is mounted by means of glue in a horizontal notch 29
10 formed at the side edge 9, 11, and a connecting portion 30 connecting the second coupling element 27 and the flange 28. In its upper side and underside, the flange 28 is provided with longitudinal ducts 31 that are substantially rectangular in cross-section.

15 When attaching the male coupling means 4, 5 to the floor board 1, which is also done in the factory during manufacture of the floor board, glue is applied to the flange 28, which is then inserted into the notch 29. When the glue has set, it adheres well to the upper and lower
20 limiting walls of the notch 29 since the core of the floor board 1 in which the notch 29 has been formed here is made, as mentioned above, of a fibreboard or the like. The glue does not adhere as well to the plastic material of the flange 28, however, but this is compensated for by
25 the fact that the glue, once set, fills the ducts 31 in the flange and thereby prevents the male coupling means 4, 5 from being extracted.

 The notch 29 has a widened portion 33 at its opening, said portion receiving the connecting portion 30
30 and the main part of the second coupling element 27. The widened portion 33 extends downwards to the underside of the floor board 1, but is terminated a short distance from its upper side.

 The connecting portion 30 has substantially the
35 shape of an inverted L, its vertical leg 34 abutting against the shoulder 35 formed by the transition between the main part of the notch 29 and its widened portion 33,

and its horizontal leg 36 abutting against the upper limiting wall of the widened portion 33. The vertical leg 34 of the connecting portion 30 is connected to the flange 28 and extends downwards to the level of the underside of the floor board 1, and its horizontal leg 36 is connected at its free end to the second coupling means 27. Recesses 32 for collecting any excess glue during insertion of the flange 28 of the male coupling means 4, 5 into the notch 29 are formed at the side of the vertical leg 34 that abuts against the floor board 1.

The second coupling means 27 has substantially the shape of an upwardly open V, the inner V-leg 37 of which is connected to the connecting portion 30. The upper portion of the outer V-leg 38 projects laterally a short distance beyond the long side edge/short side edge 9, 11 of the floor board 1. The outer V-leg 38 is springingly foldable in the direction of the inner V-leg 37 to such an extent that its upper portion can be inserted to a position within the side edge 9, 11. The external V-shape of the second coupling element 27 is, in its nondeformed state, i.e. the state shown in Figs 3 and 5, substantially complementary to the shape of the groove 22 of the first coupling element 12. In this context (see Fig. 5), "complementary" means that the inner V-leg 37 of the second coupling element 27 is inclined at the same angle as the outer limiting wall 26 of the groove 22 and that, when a male coupling means 4, 5 of a floor board 1 engages a female coupling means 2, 3 of another floor board 1, the outer V-leg 38 of the second coupling element 27 of said male coupling means abuts, in its nondeformed state, against the stop surface 24 of the first coupling element 12 of said female coupling means while the second coupling element 27 rests against the bottom of the groove 22 and its inner V-leg 37 abuts against the outer limiting wall 26 of the groove 22.

When installing a floor 6 on a support surface 39 by means of floor boards 1 according to the present inven-

tion, a first floor board 1 is arranged substantially horizontally in such manner relative to an already installed second floor board 1 that the second coupling element 27 in one of its male coupling means 4, 5 is located substantially directly above the first coupling element 12 in the corresponding female coupling means 2, 3 of the installed second floor board 1 (see Fig. 3). In this position, the projecting upper portion of the outer V-leg 38 rests against the long side edge/short side edge 8, 10 of the installed second floor board 1 and the lower portion of the inner V-leg 37 rests against the outer limiting wall 26 of the groove 22 in the first coupling element 12.

From this position, the first floor board 1 is pressed downwards towards the support surface 39. The first floor board 1 is thus moved by slidingly displacing the inner V-leg 37 of the second coupling element 27 on the outer limiting wall 26 of the groove 22 closer to the installed second floor board 1 while the outer V-leg 38 of the second coupling element 27 is springingly folded in the direction of the inner V-leg 37 (see Fig. 4). Once the V-shaped second coupling element 27 has been completely inserted into the groove 22 of the first coupling element 12, its outer V-leg 38 will spring back to its original nondeformed state and snap in under the stop surface 24. In this connected state (See Fig. 5), the two floor boards 1 are on a level with each other and abut against each other side edge 8, 10 to side edge 9, 11 without any play.

If, for some reason, the floor 6 is to be taken up, the first floor board 1 is lifted slightly from the surface 39 in the way shown in Fig. 6 by means of a suitable tool, for example a crowbar, which results in the adjacent floor boards 1 being inclined relative to one another. This inclination is made possible by the fact that, in the connected state, there is a wedge-shaped, free space 40 between the outwardly facing side 21 of the

first coupling element 12 and the vertical L-leg 34 of the connecting portion 30 and a wedge-shaped, free space 41 between the inner limiting wall 25 of the groove 22 and the outer V-leg 38 of the second coupling element 27.

5 From this elevated position, the floor board 1 provided with the female coupling means 2, 3 is pressed downwards towards the support surface while the floor board 1 provided with the male coupling means 4, 5 is retained in the elevated position. The floor boards 1 are thus dis-
10 engaged from each other without breaking, which allows them to be reused.

The floor board 1 described above may be modified in various ways within the scope of the invention. Thus, the plastic sections forming the coupling means 2-5 may, for
15 example, be replaced by coupling means that are milled directly in the floor board, when the latter is made of a composite material with a certain resiliency which consists of compressed plastic and wood powder.

CLAIMS

1. A floor board of elongated rectangular shape,
5 which comprises coupling means (2-5) at its side edges
(8-11) and which is arranged to be connected to other
similar floor boards to form a floor (6), which is made
up of a plurality of adjacent, parallel rows (7a, 7b, 7c)
of juxtaposed floor boards (1) and in which the floor
10 boards of one and the same row are interconnected short
side to short side and the floor boards of adjacent rows
are interconnected long side to long side, the coupling
means being composed of a first pair of coupling means
(2, 4) consisting of a female coupling means (2) and a
15 male coupling means (4), which extend along the one and
the other long side edges (8, 9) of the floor board, re-
spectively, and a second pair of coupling means (3, 5)
consisting of a female coupling means (3) and a male
coupling means (5), which extend along the one and the
20 other short sides (10, 11) of the floor board, respec-
tively,

c h a r a c t e r i s e d i n

that the female coupling means (2, 3) in at least
one of said two pairs of coupling means (2, 4; 3, 5)
25 comprises a first coupling element (12), which projects
laterally from said one long side edge/short side edge
(8/10) and extends along this edge at a level below the
upper surface of the floor board and which has an up-
wardly open groove (22) extending along the first coup-
30 ling element (12) and an upper portion (23) with a lower
surface (24), which extends obliquely upwards and over
the groove (22) a short distance from the inner limiting
wall (25) thereof so as to form a stop,

that the male coupling means (4, 5) in said one pair
35 of coupling means comprises a second coupling element
(27), which has substantially the shape of an upwardly
open V and which extends along said other long side

edge/short side edge (9/11) in a longitudinal recess (29, 33) formed in the lower portion thereof, the outer V-leg (38) of the second coupling element (27) being springingly foldable in the direction of the inner V-leg (37) of the second coupling element (27), and

that the external V-shape of the second coupling element (27) in its nondeformed state is substantially complementary to the shape of the groove (22) of the first coupling element (12),

the two coupling elements (12, 27) being located in such manner that, when interconnecting two similar floor boards, the groove (22) in the first coupling element (12) of one of the floor boards is situated directly under the substantially V-shaped second coupling element (27) of the other floor board when the floor boards are in such a position relative to each other that their side edges (8, 9; 10, 11) facing each other are vertically aligned, and

the two floor boards being interconnectible by pressing the second coupling element (27) of said other floor board down into the first coupling element (12) of said one floor board, whereby the outer V-leg (38) of the second coupling element (27) is springingly folded, said V-leg springing back to its initial position and snapping in under said stop once the second coupling element (27) has been inserted into the first coupling element (12).

2. A floor board according to claim 1, wherein the upper portion of the outer V-leg (38) of the second coupling element (27) projects laterally from said other long side edge/short side edge (9/11).

3. A floor board according to claim 1 or 2, wherein the female coupling means (2, 3) comprises a first plastic section having a flange (13), which projects laterally from the first coupling element (12) and which is mounted in a first notch (14) formed at said one long side edge/short side edge (8/10).

4. A floor board according to claim 3, wherein the flange (13) of the first plastic section is mounted in the first notch (14) by means of glue.

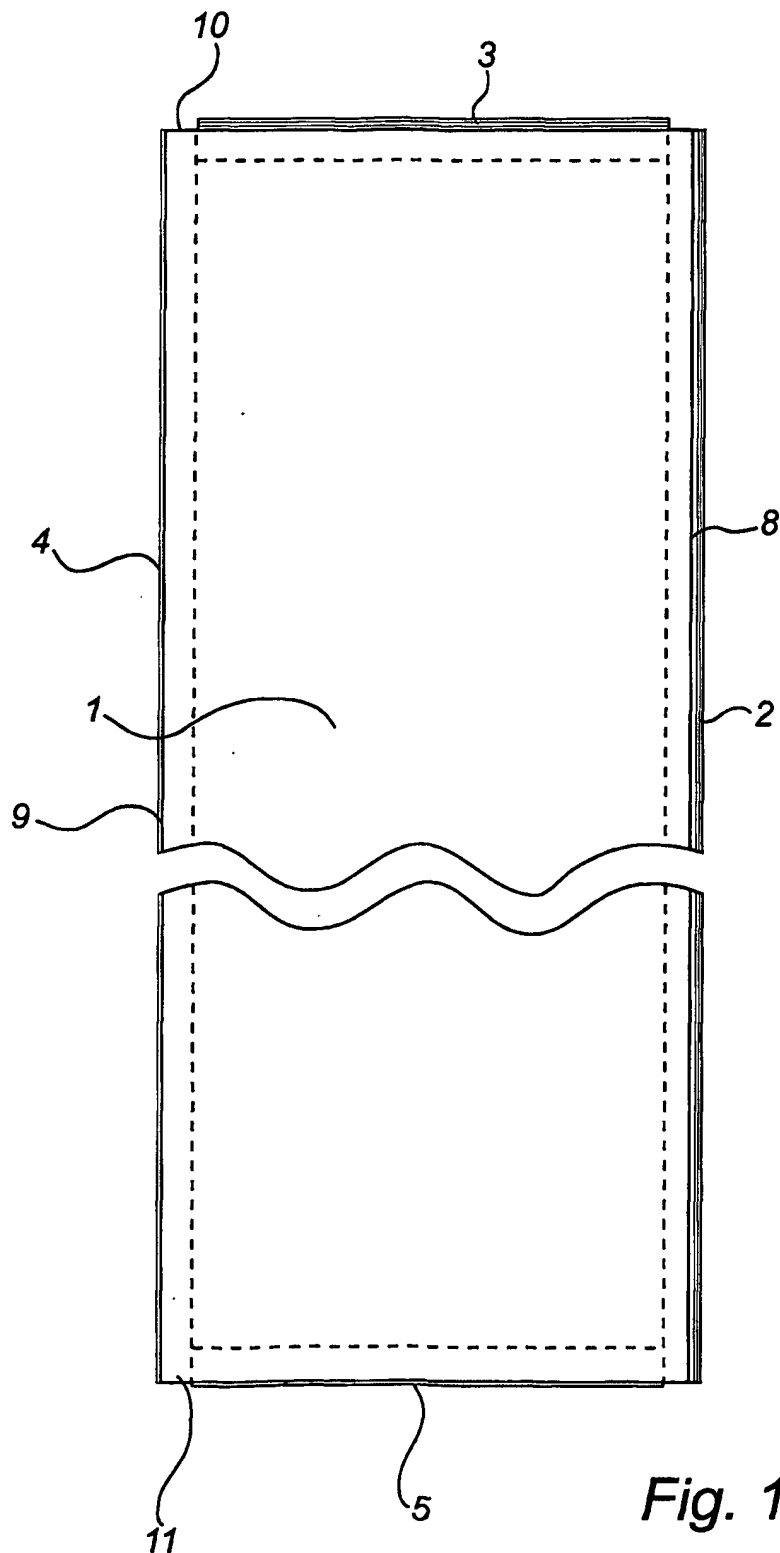
5. A floor board according to claim 4, wherein the flange (13) of the first plastic section is provided with longitudinal, glue-receiving ducts (15) that are substantially rectangular in cross-section.

6. A floor board according to any one of the preceding claims, wherein the male coupling means (4, 5) comprises a second plastic section having a flange (28), which projects laterally from the second coupling element (27) and which is mounted in a second notch (29) formed at said other long side edge/short side edge (9/11).

7. A floor board according to claim 6, wherein the flange (28) of the second plastic section is mounted in the second notch (29) by means of glue.

8. A floor board according to claim 7, wherein the flange (28) of the second plastic section is provided with longitudinal, glue-receiving ducts (31) that are substantially rectangular in cross-section.

1/3



2/3

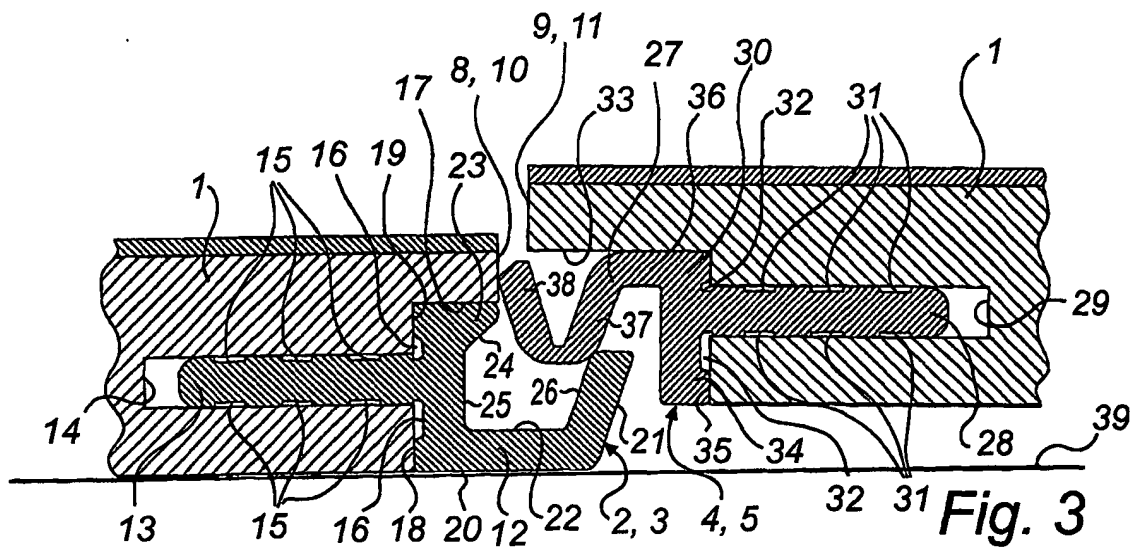


Fig. 3

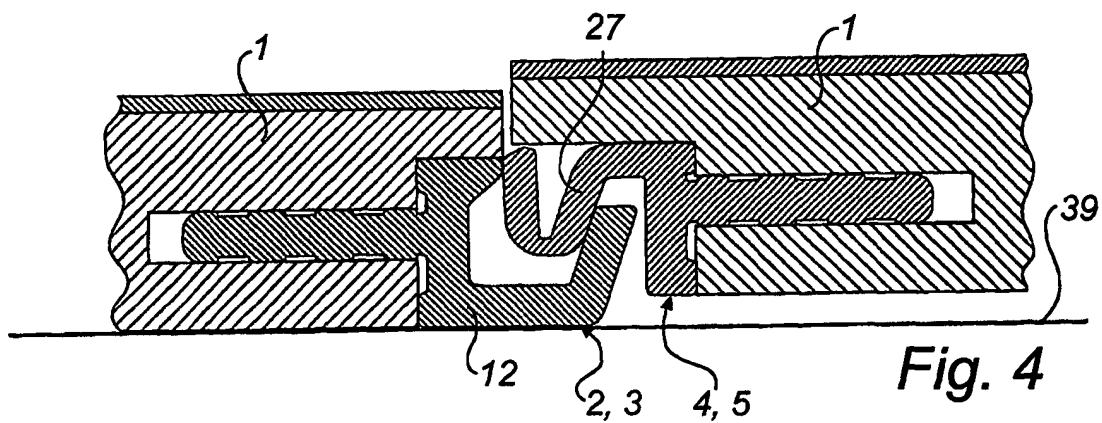


Fig. 4

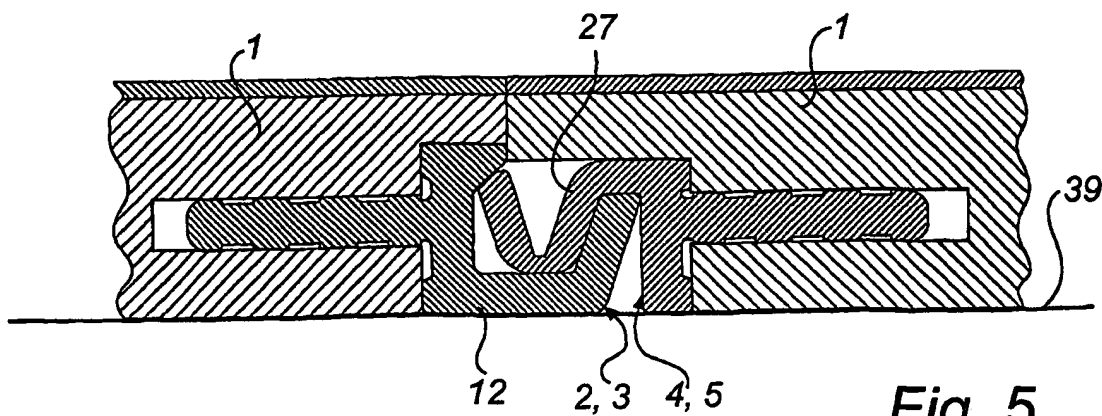


Fig. 5

3/3

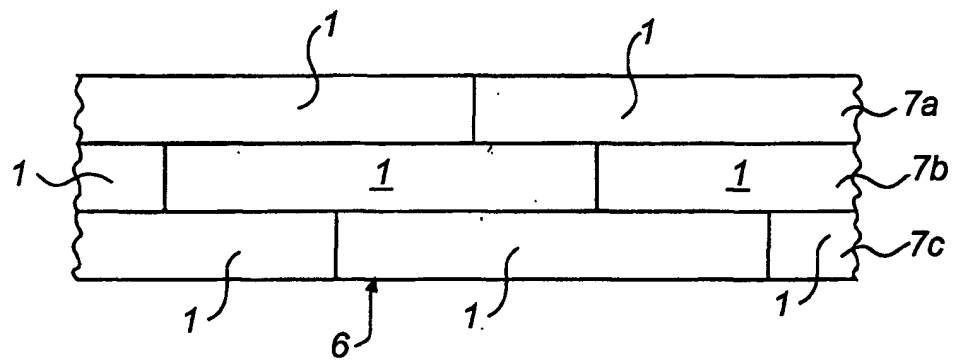


Fig. 2

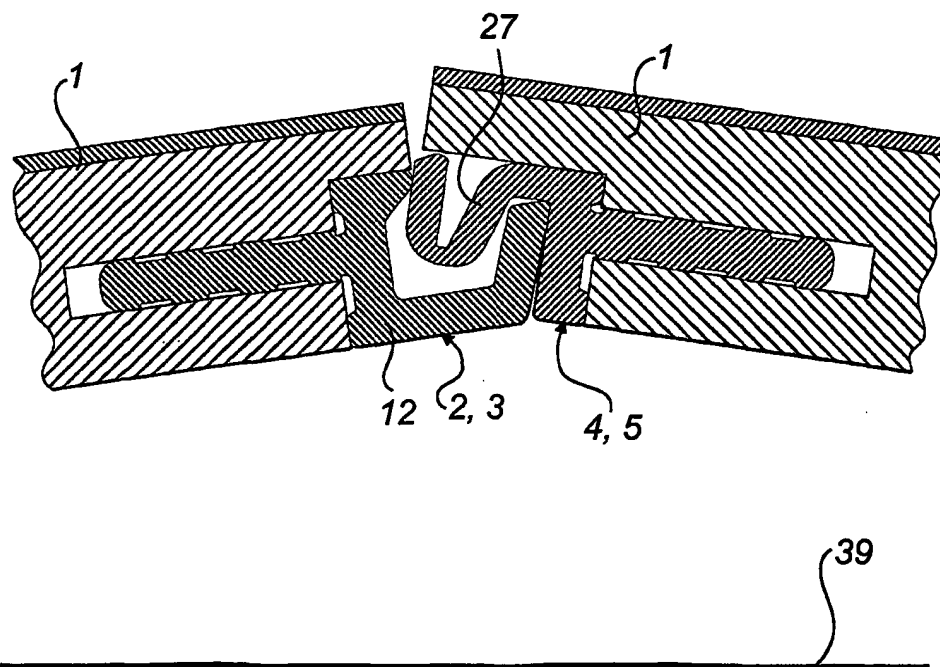


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 01/01343

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E04F 15/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E04F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9627719 A1 (PERSTORP FLOORING AB), 12 Sept 1996 (12.09.96), figure 1, abstract --	1-8
A	DE 3343601 A1 (BÜTEC GESELLSCHAFT FÜR BÜHNENTECHNISCHE EINRICHTUNGEN MBH), 13 June 1985 (13.06.85), abstract, details 10,10 ¹ --	1-8
A	US 3859000 A (J.L. WEBSTER), 7 January 1975 (07.01.75), figure 2, abstract -- -----	1-8

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

21 Sept. 2001

Date of mailing of the international search report

27-09-2001

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Örjan Nylund / MRo

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

03/09/01

PCT/SE 01/01343

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	9627719	A1	12/09/96	AU	710758 B	30/09/99
				AU	2941495 A	25/01/96
				AU	5017696 A	23/09/96
				EP	0730435 A	11/09/96
				JP	9502639 T	18/03/97
				SE	502994 C,E	04/03/96
				SE	9500809 A	04/03/96
				US	5779477 A	14/07/98
DE	3343601	A1	13/06/85	CH	666499 A	29/07/88
US	3859000	A	07/01/75	NONE		